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EXAMINER	
HINES, ANNE M	

ART UNIT	PAPER NUMBER
2879	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/583,236	ZHU ET AL.	
	Examiner	Art Unit	
	ANNE M. HINES	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19,21,23-25,27,28 and 30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19, 21, 23-25, 27-28, and 30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The amendment filed on April 16, 2009, has been entered and acknowledged by the Examiner.

Claims 1-19, 21, 23-25, 27-28, and 30 are pending in the instant application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 9, 11, 28, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Winans et al. (US 2002/0173354) (of record) in view of Grace et al. (US 6856086).

Regarding claim 1, Winans teaches a flexible organic light emitting device comprising a flexible substrate (Fig. 7, 451; Page 12, Paragraph [0119]), a lower electrode layer the flexible substrate (Fig. 7, 452; Page 12, Paragraph [0117]), an upper electrode layer that is at least semi-transparent (Fig. 7, 454; Page 12, Paragraph [0117]; Page 12, Paragraph [0120]), an organic region between the lower electrode layer and the upper electrode layer, in which electroluminescence can take place when a voltage is applied between the lower electrode and the upper electrode (Fig. 7, 453; Page 12, Paragraph [0116]), wherein the flexible substrate is comprised of either a metal foil or a

plastic film (Page 12, Paragraph [0119]), and wherein when a metal foil is used, the substrate is disposed such that light generated as a result of the electroluminescence directed towards the metal foil is reflected back to the at least semi-transparent upper electrode layer for enhancing light output from the flexible organic light emitting device (Page 12, Paragraph [0119]). Winans fails to teach wherein the substrate comprises both an upper substrate layer comprised of a plastic, a polymer, or a dielectric and a lower metal substrate layer and the lower electrode is formed on the upper substrate layer.

In the same field of endeavor, Grace teaches wherein a flexible composite substrate layer includes both an upper substrate layer of a polymer laminated with a lower reflective metal substrate layer (Fig. 1, 32 & 40; Column 4, lines 15-34; Column 7, lines 3-11) in order to provide a substrate with a moisture and oxygen barrier and structural stability (Column 7, lines 3-11).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the invention of Winans to have the flexible substrate be the flexible substrate of Grace including both an upper substrate layer of a polymer laminated with a lower reflective metal substrate layer in order to provide a substrate with a moisture and oxygen barrier and structural stability, as disclosed by Grace.

Regarding claim 9, Winans further discloses wherein the upper electrode layer is transparent (Page 12, Paragraph [0120]).

Regarding claim 11, Winans further discloses wherein the upper electrode layer is a semitransparent or transparent cathode (Page 12, Paragraph [0120]).

Regarding claim 28, Winans further discloses wherein the organic region comprises a hole transporting layer and an emissive layer or an electron transporting layer (Page 12, Paragraph [0116]).

Regarding claim 30, Winans further discloses wherein the organic region comprises a hole transporting layer, an emissive layer, and an electron transporting layer (Page 12, Paragraph [0116]).

Claims 1, 2-8, 12-13, 15 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mishima (US 2003/0178937) (of record) in view of Grace et al. (US 6856086).

Regarding claim 1, Mishima teaches a flexible organic light emitting device comprising a flexible substrate (Page 2, Paragraph [0023]), a lower electrode layer the flexible substrate (Page 3, Paragraph [0034]), an upper electrode layer that is at least semi-transparent (Page 5, Paragraph [0066]), an organic region between the lower electrode layer and the upper electrode layer, in which electroluminescence can take place when a voltage is applied between the lower electrode and the upper electrode (Page 3, Paragraphs [0039]-[0044]), wherein the flexible substrate is comprised of an upper substrate layer of a polymer layer laminated to a lower substrate layer comprised of a metal foil (Page 2, Paragraphs [0023]-[0024]). Mishima fails to teach wherein the metal foil is reflective such that light generated as a result of the electroluminescence directed towards the metal foil is reflected back to the at least semi-transparent upper electrode for enhancing light output from the flexible organic light emitting device.

In the same field of endeavor, Grace teaches wherein a flexible composite substrate layer includes both an upper substrate layer of a polymer laminated with a lower reflective metal foil substrate layer (Fig. 1, 32 & 40; Column 4, lines 15-34; Column 7, lines 3-11) in order to provide a substrate with a moisture and oxygen barrier and structural stability as well as reflect light back toward the top of the device through the upper substrate layer (Column 7, lines 3-11).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the invention of Winans to have the flexible substrate be the flexible substrate of Grace including both an upper substrate layer of a polymer laminated with a lower reflective metal substrate layer in order to provide a substrate with a moisture and oxygen barrier and structural stability as well as reflect light back toward the top of the device through the upper substrate layer, as disclosed by Grace.

Regarding claim 2, Mishima further discloses wherein at least one of the upper and lower electrodes has an interfacial modified surface for enhancing charge carrier injection (Page 3, Paragraph [0033]).

Regarding claim 3, Mishima further discloses wherein the at least one of the upper or lower electrodes comprises a metal electrode, and wherein the interfacial surface is modified using inorganic or organic materials or a transparent conductive oxide (Page 3, Paragraph [0033]).

Regarding claim 4, Mishima further discloses wherein the flexible substrate is comprised of a plastic layer laminated to or coated with an aluminum layer, the plastic

layer being positioned between the lower electrode and the aluminum layer (Page 2, Paragraph [0023]).

Regarding claim 5, Mishima further discloses wherein the flexible substrate is comprised of a steel foil (Page 2, Paragraph [0023]).

Regarding claim 6, Mishima further discloses wherein the device further comprises an isolation layer between the flexible substrate and the lower electrode layer (Page 2, Paragraph [0023]).

Regarding claim 7, Mishima further discloses wherein the isolation layer is a spin-coated polymeric layer or a dielectric layer (Page 2, Paragraph [0024]).

Regarding claim 8, Mishima further discloses an isolation layer between the steel foil and the lower electrode (Page 2, Paragraph [0023]).

Regarding claim 12, Mishima further discloses wherein the upper electrode layer is a multilayer structure comprising at least one semitransparent or transparent conductive film (Page 5, Paragraph [0067]).

Regarding claim 13, Mishima further discloses wherein the multilayer structure comprises an index-matching layer of a material having an index of refraction index chosen such that the light output is further enhanced, and a charge carrier injection layer (Page 5, Paragraph [0067]; Page 7, Paragraph [0086]). Note that the Examiner considers the phrase ‘chosen such that the light output is further enhanced’ to be a claim to a product by process; in a claim to a device it is the claimed structure and not the process which is given patentable weight, in this instance Mishima's disclosed

structure of an aluminum layer with an ITO layer formed on it characteristically meets the required structure of a charge injection layer with an index-matching layer.

Regarding claim 15, Mishima further discloses wherein the index-matching layer comprises an inorganic material having a refractive index effective for enhancing light output (Page 7, Paragraph [0086]).

Regarding claim 23, Mishima further discloses wherein the multilayer structure is a cathode and the charge carrier injection layer is an electron injection layer (Page 5, Paragraph [0067]; Page 7, Paragraph [0086]).

Regarding claim 24, Mishima further discloses wherein the electron injection layer comprises a low work function metal (Page 5, Paragraph [0067]; Page 7, Paragraph [0086]).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Winans et al. (US 2002/0173354) (of record) and Grace et al. (US 6856086) in view of Silvernail et al. (US 6597111) (of record).

Regarding claim 10, Winans and Grace teach the invention of claim 1, including wherein both the anode and cathode are multi-layer are transparent layers (Page 12, Paragraphs [0117]-[0120]), but fails to teach wherein light from the top-emitting device is emitted through the anode.

In the same field of endeavor, Silvernail teaches wherein an OLED is provided with either the anode or cathode as the top light emitting electrode, thus exemplifying

recognized equivalent structures of the OLED in the art (Figs. 1A-1B; Column 1, line 52 to Column 2, line 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the top light emitting electrode of Winan and Grace as the anode instead of as the cathode, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Silvernail's teaching.

Claims 14 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mishima (US 2003/0178937) (of record) and Grace et al. (US 6856086) in view of Tyan et al. (US 2004/0149984) (of record).

Regarding claim 14, Mishima and Grace teach the invention of claim 13, but fail to teach wherein the index-matching layer comprises an organic material having a refractive index for enhancing light output.

In the same field of endeavor, Tyan teaches a top-emitting OLED with a cathode including an electron injection layer of Li and Ag and an organic index-matching layer of Alq3 as an absorption reduction layer (Page 11, Paragraphs [0109]-[0115]) with a high refractive index in order to improve the luminance of the device (Page 3, Paragraph [0034]).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the invention of Mishima and Grace to have the multi-layer cathode have a high

refractive index absorption reduction layer of Alq3 in order to improve the luminance of the device, as disclosed by Tyan.

Regarding claim 25, Mishima and Grace teach the invention of claim 13, including wherein the electron injection layer is a rare earth metal (Mishima Page 5, Paragraph [0067]), but fail to teach wherein the index-matching layer comprises Alq3 or NPB.

In the same field of endeavor, Tyan teaches a top-emitting OLED with a cathode including an electron injection layer of Li and Ag and an organic index-matching layer of Alq3 as an absorption reduction layer (Page 11, Paragraphs [0109]-[0115]) with a high refractive index in order to improve the luminance of the device (Page 3, Paragraph [0034]).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the invention of Mishima and Grace to have the multi-layer cathode have a high refractive index absorption reduction layer of Alq3 in order to improve the luminance of the device, as disclosed by Tyan.

Claims 16-19, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mishima (US 2003/0178937) (of record) and Grace et al. (US 6856086) in view of Silvernail et al. (US 6597111) (of record).

Regarding claim 16, Mishima and Grace teach the invention of claim 13, including wherein both the anode and cathode are multi-layer structures including

charge injection layers and transparent ITO layers (Mishima Page 3, Paragraph [0033]; Page 5, Paragraph [0067]), but fail to teach wherein light from the top-emitting device is emitted through the anode.

In the same field of endeavor, Silvernail teaches wherein an OLED is provided with either the anode or cathode as the top light emitting electrode, thus exemplifying recognized equivalent structures of the OLED in the art (Figs. 1A-1B; Column 1, line 52 to Column 2, line 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the top light emitting electrode of Mishima and Grace as the anode instead of as the cathode, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Silvernail's teaching.

Regarding claim 17, Mishima further discloses wherein the hole injection layer comprises a high work function metal or a transparent conductive oxide (Page 3, Paragraph [0033]).

Regarding claim 18, Mishima further discloses wherein the high work function metal is gold or silver (Page 3, Paragraph [0033]).

Regarding claim 19, Mishima further discloses wherein the transparent conductive oxide is ITO (Page 3, Paragraph [0033]).

Regarding claim 21, Mishima further discloses wherein the hole injection layer comprises an organic material, an inorganic material, or a combination of inorganic an organic materials that are effective for hole injection (Page 3, Paragraph [0033]).

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mishima (US 2003/0178937) (of record) and Grace et al. (US 6856086) in view of Lee et al. (US 2003/0234608) (of record).

Regarding claim 27, Mishima and Grace teach the invention of claim 23, and wherein the cathode is a two layer structure comprising an electron injection layer of Ca and a second layer of Ag (Mishima Page 5, Paragraph [0067]; Page 6, Paragraph [0070]; Page 3, Paragraph [0033]), but fail to teach wherein the cathode comprises a lithium fluoride layer under the Ca layer.

In the same field of endeavor, Lee teaches wherein the electron injection layer for an OLED is a Ca/LiF laminate with the LiF layer adjacent the organic layers of the organic device in order to provide an electron injection layer that keeps the driving voltage of the device low (Pages 4-5, Paragraphs [0057]-[0058]).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the invention of Mishima and Grace to have the electron injection layer be the Ca/LiF laminate of Lee with the LiF layer closer to the organic layers of the device in order to provide an electron injection layer that keeps the driving voltage of the device low, as disclosed by Lee.

Response to Arguments

Applicant's arguments filed April 16, 2009 have been fully considered but they are not persuasive.

With respect to the rejection of claim 1 over the Winans and Grace references, Applicant argues that neither the Winans or Grace references teaches or suggests a metal layer that reflects light. Applicant argues that the Grace reference, upon which the Examiner has relied, and specifically argues that layer 40 could not reflect light generated by the device since the Grace reference includes a number of additional layers that protect the structure from a laser light for patterning the device electrodes of Grace.

The Examiner respectfully disagrees. Winans teaches an OLED including reflective metal substrate that reflects light generated by the OLED towards the upper emission surface of the device (Winans: Paragraph [0119]); Grace teaches a substrate with an outer metal layer wherein "in embodiments for which the back substrate 32 is transparent" ..."a metal protective layer may also function as a reflective layer" (Grace: Column 7, lines 3-11). Since both Winans and Grace both teach reflective metal layers in a substrate structure, and Grace further teaches a transparent non-metal substrate over the metal layer in order to improve the moisture and oxygen barrier properties of the substrate, the Examiner maintains that it would be obvious to have the two layer substrate structure of Grace in the invention of Winans. Although Grace teaches further layers over the substrate that are relevant to the display device of Grace, it is not considered that one of ordinary skill in the art would be compelled to include them in a modification of Winans that is informed by the invention of Grace since an improvement in moisture and oxygen barrier properties without taking away the desired light reflecting

properties of Winans would be achieved by modifying Winans to have the two layer substrate as set out in the rejection of claim 1, above.

With respect to the rejection of claim 1 over the Mishima in view of Grace references, Applicant argues that there is no disclosure or suggestion in the Grace reference of light generated by the device would ever reach the metal layer of the Grace substrate and be reflected back toward the device.

The Examiner respectfully disagrees. Grace states: "in embodiments for which the back substrate 32 is transparent and the opaque layer 44 is eliminated, a metal protective layer may also function as a reflective layer" (Grace: Column 7, lines 3-11). If light could not reach and be reflected back from the metal layer of Grace, Grace would not have explicitly stated that the metal layer could be reflective in the instance where the layer above it is transparent and another layer which is opaque is removed; the Examiner maintains that Grace, therefore, discloses a substrate comprised of a transparent layer with a reflective metal layer underneath, like the invention of Mishima, wherein the metal layer is reflective.

With respect to claims 2 and 3, Applicant argues that Mishima does not teach or suggest an anode with an interfacial modified surface (required by claims 2 and 3) and wherein the interfacial modification uses inorganic, organic, or transparent conductive oxide as the material (required by claim 3).

The Examiner respectfully disagrees. Paragraph 0033 of Mishima discloses an anode formed of a laminate of a metal and one of a conductive metal oxide, an inorganic conductive compound, or an organic conductive compound. The Examiner

considers the interfacial modified surface as being met by the disclosed layer in the laminate that is in addition to the metal layer (ie the conductive metal oxide, inorganic conductive compound, or organic conductive compound). Therefore, the rejection of claim 2 is maintained.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anne M. Hines whose telephone number is (571) 272-2285. The examiner can normally be reached on Monday through Friday from 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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